
Young women's responses to smoking and breast cancer risk information

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Abstract

Current evidence confirms that young women who smoke or who have regular long-term exposure to secondhand smoke (SHS) have an increased risk of developing premenopausal breast cancer. The aim of this research was to examine the responses of young women to health information about the links between active smoking and SHS exposure and breast cancer and obtain their advice about messaging approaches. Data were collected in focus groups with 46 women, divided in three age cohorts: 15–17, 18–19 and 20–24 and organized according to smoking status (smoking, non-smoking and mixed smoking status groups). The discussion questions were preceded by information about passive and active smoking and its associated breast cancer risk. The study findings show young women's interest in this risk factor for breast cancer. Three themes were drawn from the analysis: making sense of the informa-

tion on smoking and breast cancer, personal susceptibility and tobacco exposure and suggestions for increasing awareness about tobacco exposure and breast cancer. There was general consensus on framing public awareness messages about this risk factor on 'protecting others' from breast cancer to catch smokers' attention, providing young women with the facts and personal stories of breast cancer to help establish a personal connection with this information and overcome desensitization related to tobacco messages, and targeting all smokers who may place young women at risk. Cautions were also raised about the potential for stigmatization. Implications for raising awareness about this modifiable risk factor for breast cancer are discussed.

Introduction

Breast cancer is the most commonly reported cancer among women under the age of 50 years and is the most common cancer-causing death for this age group in Canada [1]. Although younger women are less often diagnosed with breast cancer, their cancers are generally more aggressive and result in lower survival rates [2]. There is now causal evidence that young women who smoke or who have regular long-term exposure to secondhand smoke (SHS) have an increased risk of developing breast cancer before menopause [3–6]. Although causal mechanisms are as yet unclear, epidemiological and toxicological studies have shown that breast tissue, during breast cell proliferation between puberty and first

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pregnancy, is very sensitive to exposure to carcinogens [7, 8]. Despite these findings, few tobacco reduction efforts have included attempts to raise awareness about active smoking and SHS as risk factors for breast cancer. Thus, there is an urgent need to increase awareness about this modifiable risk for breast cancer and to encourage young women to avoid smoking and exposure to tobacco smoke.

Background literature

There has been increasing interest in the association between tobacco exposure and increased breast cancer risk. In two separate meta-analyses of studies published before 2002, researchers came to similar conclusions that passive and active smoking equally increased the risk of female breast cancer in younger primarily premenopausal women [3, 5]. Based on his meta-analysis of 20 studies, Johnson [5] reported that the risk of breast cancer due to SHS was concentrated in premenopausal women/women under the age of 50. For the 14 studies that had evaluated risk in premenopausal/younger women, the summary risk estimate was a 68% increase in risk. Furthermore, the risk was doubled among 5 of 14 studies with the best quality secondhand smoke measurements. A third meta-analysis conducted by the US Surgeon General [6] concluded that the evidence was suggestive. The results of epidemiological studies and meta-analyses published on various aspects of breast cancer and smoking published since these three authoritative reviews have not been consistent and prompted a comprehensive review of studies by an expert panel [4]. Based on epidemiological and toxicological studies, as well as an understanding of biological mechanism, the panel concluded that there is a causal association between active smoking and premenopausal breast cancer. In addition, the panel concluded that SHS and breast cancer in younger primarily premenopausal women who never smoked is consistent with causality. To date, tobacco control efforts have not included attempts to raise awareness of tobacco exposure as a risk factor for breast cancer. In particular, the development of messaging strategies aimed at young women is a pressing priority.

Systematic reviews of research examining the effectiveness of anti-smoking media campaigns to reduce smoking prevalence among youth suggests that these campaigns have positive effects; however, specific factors, including message patterns, contributing to program success are less clear [9, 10]. Although these campaigns along with other tobacco control measures have reduced the prevalence of active smoking and passive exposure to tobacco smoke in Canada, smoking among young women and exposure to SHS in some settings (particularly homes) remains very common [11]. Beliefs about the health risks of smoking (e.g. lung cancer and other diseases) have been reported to inhibit smoking onset among adolescents, particularly among girls who placed a high value on health [12]. Knowledge of the risk of breast cancer could be an additional deterrent to smoking and to minimizing young women's exposure to SHS. In 2006, the Ontario-based 'Parent Action on Drugs' group conducted focus groups and an on-line survey to assess young women's (16–20 years old) knowledge of and interest in lifestyle risk factors for breast cancer [13]. In addition, they asked participants how to convey these needs in messages to reduce risks for breast cancer and promote breast health. While their research provides some helpful information and supports young women's interest in risk reduction for breast cancer (alcohol, nutrition and physical activity), the survey did not address tobacco exposure. This study extends their research by including active smoking and SHS as risk factors for breast cancer. The purpose of this paper is to provide results of a focus group study conducted to (i) gauge young women's reactions to information about the relationship between SHS, active smoking and breast cancer and (ii) gather ideas about how young women would like to receive information about this modifiable risk factor.

Methods

Focus group methods were used in this study to gather the views of young women between 15 and 24 years of age. A purposive sampling strategy

was used to obtain a sample that would maximize variation based on age, smoking status and geographic location. We selected women between the ages of 15–24 years because this is the population most at risk for smoking in Canada [14] and to ensure the sample included participants representing the differing stages of adolescent and young adult psychosocial development. We also recruited participants who were non-smokers as well as smokers. We included two sites in the study: Kelowna, British Columbia (BC), and Fredericton, New Brunswick (NB). These two locations were chosen to capture the perspectives of young women who lived in areas that represented both the lower (BC) and higher (NB) national smoking rates based on the Canadian Tobacco Use Monitoring Survey [15]. Ethics approval was obtained from the University of British Columbia and the University of New Brunswick. Informed consent was obtained from all participants.

Data collection

Six focus groups were held in Kelowna and three in Fredericton between November 2007 and September 2008. The groups were organized according to age cohort (15–17, 18–19 and 20–24) and smoking status {smoking, non-smoking and mixed smoking status groups}. Status as a smoker was defined by a positive response to the screening question asking if participants had smoked cigarettes (any amount), at least once in the past 30 days. The number of participants in each group ranged from three to eight for both sites, and each participant was given \$30 to compensate them for their time. At each location, the focus groups were conducted with at least two members of the research team acting in the role of facilitator and cofacilitator/research assistant. A prefocus group survey was completed by each participant to collect demographic and smoking data. In addition, questions were included to assess family history and knowledge of breast cancer. Participants were asked to rate their level of knowledge of breast cancer in comparison to other young women their age using a five-point likert scale (1 = 'low' and 5 = 'high').

During the focus group discussions, participants were given a brief presentation by the facilitator and an information sheet on research describing the association between breast cancer and exposure to active smoking and SHS. Statistics from the National Cancer Institute of Canada [1] on the annual number of premenopausal women diagnosed with breast cancer and the resulting deaths were presented to the participants. In addition, Canadian data on the percentage of breast cancer cases and deaths in 2006 that could be attributed to SHS and active smoking were also offered [1]. The main message presented to participants was that exposure to tobacco smoke as a young woman could more than double the risk of breast cancer later in life. The information sheet also provided links to resources available on Web sites. Participants were then invited to discuss their reactions to this information. Questions used to guide the discussion included: What do you think about this information? What do you think other young women your age will think about this information? What do you think are the best ways to raise awareness about the increased risk of breast cancer and tobacco exposure among teens and young women your age? Who else should be considered important audiences for messages about smoking and breast cancer? Probes were used to encourage participants to expand on their responses and to invite group members to respond to others' comments. The focus groups lasted ~2.5 hours.

Following each focus group session, the facilitator and cofacilitator/research assistant held debriefing sessions and recorded observations as field notes. A week following the focus groups, participants were contacted by telephone to gather any additional comments about the topics discussed stemming from further reflection and discussions with friends and family members. During these calls, participants reinforced the value of the information provided in the focus groups and reported sharing the new evidence about tobacco exposure and breast cancer risk with others in their social network.

Data analyses

The focus group sessions were audio recorded, and detailed notes were taken during the sessions to aid

transcription. After initial review of the transcripts and open coding, a coding schema was generated. The software program, NVivo, was used to assist with qualitative data analysis. Themes were identified through close readings of coded data, constant comparative analytical strategies and sharing critical reflections on the interpretations with team members. Using this process, we developed detailed descriptions from the perspective of the participants.

Results

Participants

The study sample included 46 participants. Most were Caucasian (89%), between 20 and 24 years of age (52%) and had some college or graduate school education (74%) (see Table I). Nearly one-quarter were smokers (24%). A substantial proportion had a family history of breast cancer (41%). Only 30.4% of the participants rated their knowledge of breast cancer as relatively high (≥ 4 a five-point scale). Thirty-five percent of the focus group participants in Kelowna were smokers and 10% of participants in Fredericton. There were no signifi-

cant differences between non-smokers and smokers in demographic variables, family history or level of knowledge of breast cancer.

Focus group results

The findings of the focus group discussion are described in relation to young women's efforts to make sense of the information about breast cancer and smoking and their recommendations for increasing awareness about tobacco exposure and breast cancer.

Smoking and breast cancer—making sense of the information

Although participants were aware of the link between lung cancer and active smoking, they were surprised by the evidence linking active smoking and SHS to breast cancer. Regardless of age or smoking status, this was new information and some expressed shock that it was not more widely known.

Well I'm just shocked they wouldn't tell us this, you know? [P20: yeah, in school] Like yeah, because they tell us all this other sorts of stuff you can get, and all about what happens when

Table I. Sample characteristics by smoking status ($N = 46$)

Characteristics	Total sample <i>n</i> (%)	Non-smoker ($n = 35$) <i>n</i> (%)	Smoker ($n = 11$) <i>n</i> (%)
Age (year range)			
15–17	10 (21.7)	6 (17.1)	4 (36.4)
18–19	12 (26.1)	10 (28.6)	2 (18.2)
20–24	24 (52.2)	19 (54.3)	5 (45.5)
Education			
Grades 10–12	10 (21.7)	6 (17.1)	4 (36.4)
College/graduate school	34 (73.9)	27 (77.1)	7 (63.6)
Other (5th grade, no longer in school)	2 (4.3)	2 (5.7)	0 (0.0)
Self-defined ethnic ID			
White/Caucasian	41 (89.1)	32 (91.4)	9 (81.8)
First nations/metis	2 (4.3)	1 (2.9)	1 (9.1)
West Asian	1 (2.2)	1 (2.9)	0 (0.0)
Other	2 (4.3)	1 (2.9)	1 (9.1)
Family history of breast cancer			
Yes	19 (41.3)	16 (45.7)	3 (27.3)
No	27 (58.7)	19 (54.3)	8 (72.7)

you drink, what happens to your liver, but it's never like if you smoke, what could happen to your boobs. (age 16, smoker)

Participants seemed puzzled that the carcinogens would contact or affect breast tissue and were interested in receiving detailed information about the process to make sense of the information. Their responses suggested that, while health messages regarding lung cancer and smoking were well known, this single locus on lung disease has contributed to the compartmentalization of tobacco-related risk to a specific area of the body. Presenting participants with the information about this risk factor for early breast cancer also seemed to challenge their beliefs that breast cancer is an older woman's disease.

As focus group participants were confronted with their personal susceptibility to breast cancer, smokers and non-smokers began to contemplate the potential effect of years of tobacco exposure on their health. Several smokers described the information as 'really scary' as they focused on the proportion of breast cancers that were attributed to exposure to tobacco. The young women, regardless of age and smoking status, realized for the first time that their exposure to friends' SHS at parties and in cars could have serious consequences. They were not only faced with the dilemma of wanting to protect themselves but also wanting to be with those they cared about.

I've tried having like a puff or whatever, like so many of my friends ... that I know smoke. And like I'm around it [SHS] so much, and it's like, yeah in the back of my mind it's like oh yeah nah, nah, nah. I just kind of just brush it off 'cause it's like well it can't really happen to me. But like I don't want to get breast cancer ... But they're your friends so you kinda want to be around them. (age 16, non-smoker)

For one young woman, there was sense of dependency that went along with the realization that it would be difficult to eliminate SHS from her life:

I'm gonna get breast cancer. No I believe from a history of it, and I'm around SHS constantly when I'm at home, or with my mom ... like I'm 18 and I'm at school like I'm not around her that much, but there are times when I have no choice, but to be around that kind of thing when she smokes. (age 18, non-smoker)

When the participants were asked how others were likely to respond to this information about smoking and breast cancer, there was evident concern raised by some that others may not care enough to smoke outside. One young woman expressed her frustration about her younger sister's regular exposure to SHS at home:

People are just so stubborn and they don't listen to kids. I mean my sister is 15. Why should my uncle and my father who are you know 45, and 55 respectively, why should they listen to, to my sister. Like, what does she know? You know, and, especially because this message is coming from the younger generation, and it's just like, it's totally lost. (age 21, non-smoker)

Suggestions for increasing awareness about tobacco exposure and breast cancer

Participants were asked about the best ways to increase awareness about the risks of tobacco exposure and breast cancer among women their age. All were adamant that information on this risk factor was needed. One 18-year-old smoker stated:

You know you always deal with thinking about lung cancer 'cause I smoke so you know you have to quit 'cause you're gonna get lung cancer. It's (smoking) bad for you. You know and I never thought about breast cancer. So it definitely needs to be like put out there just like somehow, however briefly, like here or there just so people actually make the connection.

The participants had a variety of suggestions that were grouped into four recommendations for messages and development of educational materials.

Make it about protecting others

Participants suggested that the main message should be about protection. For example, some thought that effective messages about breast cancer and smoking need to be directed to smokers and based on the notion that you could be 'hurting' best friends or family and 'giving them' breast cancer. Others suggested more powerful messages that smokers could be 'killing' their best friends and/or girlfriends or putting them in danger.

And like if you went from the angle like you could be hurting your friends, like you could be giving them cancer or something that would be a new take on it ... So then the smoker themselves is reading that and being, holy, like maybe I should be [going] outside like away from everyone... . Like letting them know they could be hurting their friends, I think that might kind of help. (age 17, non-smoker)

They argued that this type of message provided a new perspective on the risk of smoking and would catch smokers' attention and encourage them to move their smoke outside. One young woman, however, did not share the same confidence in this messaging strategy.

But I don't know what, like what else would really help like an actual smoker other than something happening to them or like someone they know. Like I don't think an ad would really help. I think they'd have to get like, first experience, first-hand experience [about breast cancer]. (age 16, non-smoker)

Give us the facts—keep it real

A second theme in discussions about increasing awareness of this risk factor for breast cancer related to the need for facts and real stories to create a personal connection with this information and overcome desensitization associated with years of anti-tobacco information. This was clearly reflected in some of the women's comments:

But I know like, when I was like twelve and stuff like I, I don't know I'm like, 'that's far off.' Like I'm not gonna really be affected by this except for like personal stories of like my friends and family you know? And I wouldn't think of it as myself like, oh well I need to start figuring out what I need to be doing so to like lessen my chances of getting breast cancer. (age 21, non-smoker)

Accordingly, participants did not view abstract statistics and ominous warnings about potential consequences as effective but wanted the 'real facts' and information specific to their age group and life stage, including the science and mechanisms behind the link between tobacco exposure and breast cancer. Age-based responses appeared frequently in these narratives, and it seemed important for the participants to distinguish themselves as more mature and informed than children and younger girls in their early teens. Participants also had very specific views on how messaging could target girls and young women of different ages. For example, the use of celebrities was thought to be useful in reaching young adolescents, whereas those in the upper age range of the study sample criticized the use of models often seen in advertisements and wanted more factual information. There was a sense that the power of personal stories would be particularly useful in getting the point across.

I think when it's a personal story it makes a big difference because you can relate to it ... until you put a face and like a story to it, it doesn't like, it can only be facts for like a lot of people until you put it with a personal story and you feel their emotion and stuff. (age 21, non-smoker)

The telling of personal stories of breast cancer during the focus group discussions was also an indication that the narrative form might be a powerful vehicle for this message. Participants suggested inviting guest speakers who had experienced breast cancer to speak to students at schools or in classes and to provide detailed information about tobacco exposure and breast cancer in a way that young women of all ages could identify with.

Finding a way to target those ads toward the younger audience like, by, showing a mother of a 13 or 14 year old girl who have, has cancer because she has been smoking since she was, like her daughter's age or having a 22 year old with cancer or something like that. Umm, that it depicts the risks of ... smoking leading to breast cancer in younger people like us. (age 21, non-smoker)

Other suggestions included having younger women as facilitators and adding this topic to existing sexual health and substance abuse school programming. One smoker suggested informal small group discussions would work best where it would be comfortable to ask questions. The importance of putting a human face on these health risks was emphasized by most participants as a way to immediately and emotionally connect to the issue.

Think about what will work best

In discussion, participants pointed to the failure of current anti-tobacco campaigns to develop messaging that speaks to adolescents and young adults, particularly young women. There were, however, competing views about what would work best. For example, one participant's suggested strategy, that would formally exclude people who smoked in the workplace, implied that further stigmatization of smokers might motivate cessation among youth:

Like for people that are addicted or the, the best um strategy to attack them is uh to say that smoking is evil. You know like it just has that notion that like if, you gotta go outside if you want to smoke, they feel kind of left out ... They should just like encourage that, they'd be like oh you stink ... Like if you smell like cigarettes you cannot come to work, something, something weird like that where people would feel really uncomfortable with it. It might not be a nice way to do it but it is an effective way for that. (age 20, non-smoker)

Others cautioned that stigmatization of smoking in messages related to breast cancer and smoking

might have unintended consequences. One participant, for example, warned about making the link between breast cancer and active smoking and SHS by drawing comparisons between the way breast cancer and lung cancer are viewed and supported in the community.

One of my worries is, you look at so many people with lung cancer, and lung cancer has massive stigma that goes with it. There isn't a whole lot of respect out there regardless of whether it is correlated to smoking in the past or not. One of the beautiful things about ah, beautiful in the sad, horrible way, things about breast cancer is there is a huge community or support network for it. (age 21, non-smoker)

There were also competing views about whether messages should be framed in positive or negative ways. Younger women in the focus groups tended to support the use of fear-based campaigns that use graphic images (e.g. a diseased lung or mastectomy scars) or a hard-hitting message (e.g. focused on death) to communicate breast cancer risk from smoking. However, those in older age groups frequently spoke of the need to emphasize a positive or empowering message when presenting information about the increased risk of breast cancer due to tobacco exposure.

Like even though I know that smoking is bad like it causes terrible things and everything, when I see an ad like picturing someone with like, that girl's teeth I think it, I think it's kind of obnoxious. Like that people are attacking it whereas an ad like with something more positive...That, it makes like such a big difference if it's positive rather than like attacking something. Encouraging is always better. (age 18, smoker)

Get the message out to everyone ('it's everyone's problem')

In addition to getting the message out to young women, participants thought all smokers should hear about this risk factor for breast cancer. In

particular, they suggested that male smokers of all ages (e.g. fathers, boyfriends, brothers, friends, etc.) should be included because of the potential for increasing the risk of breast cancer among the women in their lives. Some believed getting men's attention about this women's issue could be a challenge. One young woman advocated a 'sex sells and shock approach' and suggested that using a photograph with a woman with hands on her breasts or a man's hand on her chest with the caption—'Breasts. We love them, protect them. Smoking around women causes breast cancer' might encourage men to smoke away from women (age 20, non-smoker).

Discussion

This study is among the first to document young women's responses to information about the risk between active smoking and SHS and premenopausal breast cancer. The findings demonstrate that young women are clearly interested in receiving more information about this risk factor for breast cancer. We acknowledge that the study sample may not represent all views, and participants may have made special efforts to present themselves as responsible health-conscious young women. Conducting some focus groups that included both non-smokers and smokers may have also constrained what participants felt they could say. Nevertheless, interest in this risk factor among this age group could provide an important opportunity to intervene to decrease smoking rates and reduce exposure to SHS.

The young women's lack of knowledge of this risk factor for breast cancer is not surprising. A search of breast cancer messages targeting young women at the time of the study revealed only two messages that included direct reference to smoking as a risk factor for breast cancer [16]. On the other hand, participants' relatively high level of interest in breast cancer is likely a direct reflection of the public awareness campaigns and the consumerism that has been promoted around breast cancer in Canada. In addition, direct experiences in breast cancer activities (e.g. runs, wearing a pink ribbon,

knowing someone with breast cancer), as well as being attuned to physical changes during puberty and gendered social identity changes associated with passage into womanhood, positioned breast cancer as a disease that held personal meanings and potential importance for youth. This time of self-reflexive identity construction, which includes both lifestyle and the body [17], may in fact serve to reinforce the salience of the information about breast cancer risk and smoking, and counter tendencies among youth to discount future illnesses associated with tobacco [18]. Together, these factors are likely to influence perceived susceptibility and perceived severity to breast cancer and important factors in the Health Belief Model [19] that hold relevance for guiding the creation of health messages.

The young women in this study appeared to be invested in seeing themselves as mature and active decision makers and did not want to be protected from hearing the 'real stories' and all the facts. Representations of breast cancer that represent real women's experiences could be particularly helpful for young women who hold misconceptions about the disease or have difficulty recognizing their risk because of their developmental stage and positioning of health risks as future oriented [20]. Nevertheless, issues raised by some participants about increasing awareness of the links between breast cancer and smoking suggest that the way these real stories are presented needs to be thoughtfully considered. The risk of further stigmatization of female smokers [21], as well as the stigmatization of those diagnosed with early breast cancer (i.e. not unlike lung cancer patients), should be considered, particularly if breast cancer is constructed as a disease that could be prevented if women took action to protect themselves from tobacco smoke.

Despite being a part of a media-savvy generation that has had considerable exposure to anti-tobacco messaging in their schools, communities and in public health campaigns, participant suggestions about what they think works in relation to smoking messages varied considerably. Similar variations related to message appeals among youth have been reported by others [22] and indicate that more

research is needed to determine effective approaches. When young women tell us that they would like to see aggressive and hard-hitting fear-inducing messaging with strong visuals about breast cancer and smoking, we need to be careful how we interpret this. Advertisements that graphically portray the adverse effects of smoking are often highly rated among teens [10]. This may be because they are visually powerful and have a clear emotional pull. However, fear-based messages related to breast cancer have not been recommended for messages targeting adolescent girls because of high levels of perceived severity observed among this group [20]. Fear-based messages about tobacco and breast cancer are also problematic in that they represent smoking as an individual habit or behavior and neglect the social embeddedness of tobacco in people's lives and the reasons why they smoke [23]. This is an especially important point for adolescent and young adult smoking since tobacco use in these groups is primarily socially driven [24]. This is also true for participant endorsement of the 'sex sells' approach. Using this particular form of gendered messaging is probably not something others who are concerned about the imposition of sexuality upon teenage girls, or about related issues such as unhealthy body image and low self-esteem among young women, would endorse.

For a majority of the participants, the link between breast cancer and smoking was not simply viewed as an individual concern. Recognizing the role of SHS exposure, they recommended that health messages be framed to include the notion of protection of others and delivered to all smokers in young women's lives (fathers, mothers, siblings, boyfriends, girlfriends, etc.). This recommendation might reflect youth's difficulty in avoiding SHS exposure and lack of control over their environments (e.g. if parents smoke at home). There is evidence to suggest this strategy could be effective. Invoking the protection of vulnerable children proved highly successful in gaining support for legislation to eliminate smoking from vehicles carrying children [25]. Similar levels of community support may be possible in advocating for changes that protect young women and teens from SHS in

order to avoid breast cancer. Despite increases in the number of smoke-free homes, a recent Canadian report indicates that in 2004, 23% of youth who are non-smokers and 50% of youth who smoke were exposed to SHS in their homes on a daily basis [26]. Approximately 25% of youth were exposed to SHS in vehicles at least once in the previous week, with rates of exposure higher for females. These data suggest there is an urgent need for programs and policies to protect young women and others from SHS.

In conclusion, the expressed interest in information about smoking and breast cancer suggests that there is a real potential for effectively delivering health messages and programs that are targeted to reducing exposure to SHS and active smoking in young women to reduce their chances of developing breast cancer. In developing ways to inform young women about this risk factor for breast cancer, it will be important to help them understand the disease and current evidence about the causal mechanisms associated with tobacco exposure. A strong efficacy component to enable efforts to reduce risk is also needed. In addition, the findings suggest that educational approaches should be tailored to younger and older age groups. Further research should be directed toward evaluating approaches to raising awareness about this modifiable risk factor for breast cancer and promoting risk reduction among young women and to developing public awareness campaigns to alert others to this risk factor.

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References

1. Canadian Cancer Society/National Cancer Institute of Canada. *Canadian Cancer Statistics 2007*. Toronto, Canada: Canadian Cancer Society, 2007. Available at: http://www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/Canadian%20Cancer%20Statistics.aspx?sc_lang=en. Accessed: 29 December 2009.
2. Yankaskas BC. Epidemiology of breast cancer in young women. *Breast Dis* 2005; **23**: 3–8.
3. California Environmental Protection Agency. *Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant*. 2005. Available at: <http://www.arb.ca.gov/regact/ets2006/ets2006.htm>. Accessed: 29 December 2009.
4. Collishaw NE, Boyd NF, Cantor KP *et al*. *Canadian Expert Panel on Tobacco Smoke and Breast Cancer Risk*. Toronto, Canada: Ontario Tobacco Research Unit, OTRU Special Report Series, 2009.
5. Johnson KC. Accumulating evidence on passive and active smoking and breast cancer risk. *Int J Cancer* 2005; **117**: 619–28.
6. U.S. Department of Health and Human Services. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. Atlanta, GA, 2006. Available at: <http://www.surgeongeneral.gov/library/secondhandsmoke/>. Accessed: 29 December 2009.
7. Lash TL, Aschengrau A. Active and passive cigarette smoking and the occurrence of breast cancer. *Am J Epidemiol* 1999; **149**: 5–12.
8. Okasha M, McCarron P, Gunnell D, Smith GD. Exposures in childhood, adolescence and early adulthood and breast cancer risk: a systematic review of the literature. *Breast Cancer Res Treat* 2003; **78**: 223–76.
9. Farrelly MC, Niederpeppe J, Yarsevich J. Youth tobacco prevention mass media campaigns: past, present, and future directions. *Tob. Control* 2003; **12**: 35–47.
10. Wakefield M, Flay B, Nichter M, Giovino G. Effects of anti-smoking advertising on youth smoking: a review. *J Health Commun* 2003; **8**: 229–47.
11. Health Canada. *Canadian Tobacco Use Monitoring Survey*. 2006. Available at: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutic_2006/ann_summary-sommaire-eng.php. Accessed: 29 December, 2009.
12. Krosnick JA, Chang L, Sherman SJ *et al*. The effects of beliefs about the health consequences of cigarette smoking on smoking onset. *J Commun* 2006; **56**: 518–37.
13. Parent Action on Drugs. *Check It Out! À voir: An Assessment of Young Women's Interest in and Knowledge of the Impact of Alcohol, Nutrition and Physical Activity on Breast Health*. 2006. Available at: <http://www.parentactionondrugs.org/pdf/Check%20It%20Out%20Project%20Report%20Final.pdf>. Accessed: 29 December, 2009.
14. Health Canada. *Canadian Tobacco Use Monitoring Survey*. 2007. Available at: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutic_2007/ann_summary-sommaire-eng.php. Accessed: 29 December 2009.
15. Health Canada. *Canadian Tobacco Use Monitoring Survey*. 2005. Accessed at: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutic_2005/ann_summary-sommaire-eng.php. Accessed: 29 December 2009.
16. Haines R, Bottorff JL, Ptolemy E *et al*. Breast cancer messaging for younger women: gender, femininity and risk. *Qual Health Res*, in press.
17. Giddens A. *Modernity and Self-identity: Self and Society in the Late Modern Age*. Cambridge: Cambridge Polity Press, 1991.
18. Reardon J, Miller C. Smoking prevention messages for adolescents: how intensity, valence, and recipient of consequences affect attitude toward the ad and intent to smoke. *J Mark Theory Pract* 2008; **16**: 67–77.
19. Rosenstock IM. Historical origins of the health belief model. *Health Educ Monogr* 1974; **2**: 328–35.
20. Silk K, Bigsby E, Volkman J *et al*. Formative research on adolescent and adult perceptions of risk factors for breast cancer. *Soc Sci Med* 2006; **63**: 3124–36.
21. Kim S, Shanahan J. Stigmatizing smokers: public sentiment toward cigarette smoking and its relationship to smoking behaviours. *J Health Commun* 2003; **8**: 343–67.
22. Flynn BS, Worden JK, Bunn JY *et al*. Youth audience segmentation strategies for smoking-prevention mass media campaigns based on message appeal. *Health Educ Behav* 2009; **34**: 578593.
23. Usitalo O, Niemela-Nyrhinen J. Exploring message themes in antismoking advertising targeted at teenagers. *Young Consum* 2008; **9**: 29–36.
24. Scheffels J, Lund KE. Occasional smoking in adolescence: constructing an identity of control. *J Youth Stud* 2005; **8**: 445–560.
25. Freeman B, Chapman S, Storey P. Banning smoking in cars carrying children: an analytical history of a public health advocacy campaign. *Aust N Z J Public Health* 2008; **32**: 60–5.
26. Leatherdale ST, Smith P, Ahmed R. Youth exposure to smoking in the home and cars: how often does it happen and what do youth think about it? *Tob Control* 2008; **17**: 86–92.

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